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Fundamenta Entomologiæ:

OR, AN

INTRODUCTION

TO THE

KNOWLEDGE of INSECTS.

BEING A TRANSLATION OF THE

Fundamenta Entomologiæ of LINNÆUS,

FARTHER

Illuſtrated with Copper Plates and Additions.

By W. CURTIS, APOTHECARY.

LONDON:
Printed for the Author; and ſold by G. PEARCH,
Cheapſide, MDCCLXXII.

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ADVERTISEMENT.

THE piece of which the following is a tranſlation, was originally written by Andrew John Bladh, a pupil of the celebrated Linnæus, and afterwards publiſhed in the 7th vol. of Linnæus's AMOENITATES ACADEMICÆ.* It may therefore be conſidered if not entirely as Linnæus's own, yet as having the ſanction of his approbation.

It afforded me ſo much pleaſure in the peruſal, and appeared ſo well adapted to facilitate

* Publiſhed in 1769.

the knowledge of inſects, that I was induced to make this tranſlation of it public, in order that others might receive the ſame entertainment, and this agreeable ſtudy become more general.

The addition of the copper plates will, it is preſumed, tend to make what is contained in theſe pages better underſtood; and by that means ſtill farther anſwer the end the tranſlator had in view by this publication.

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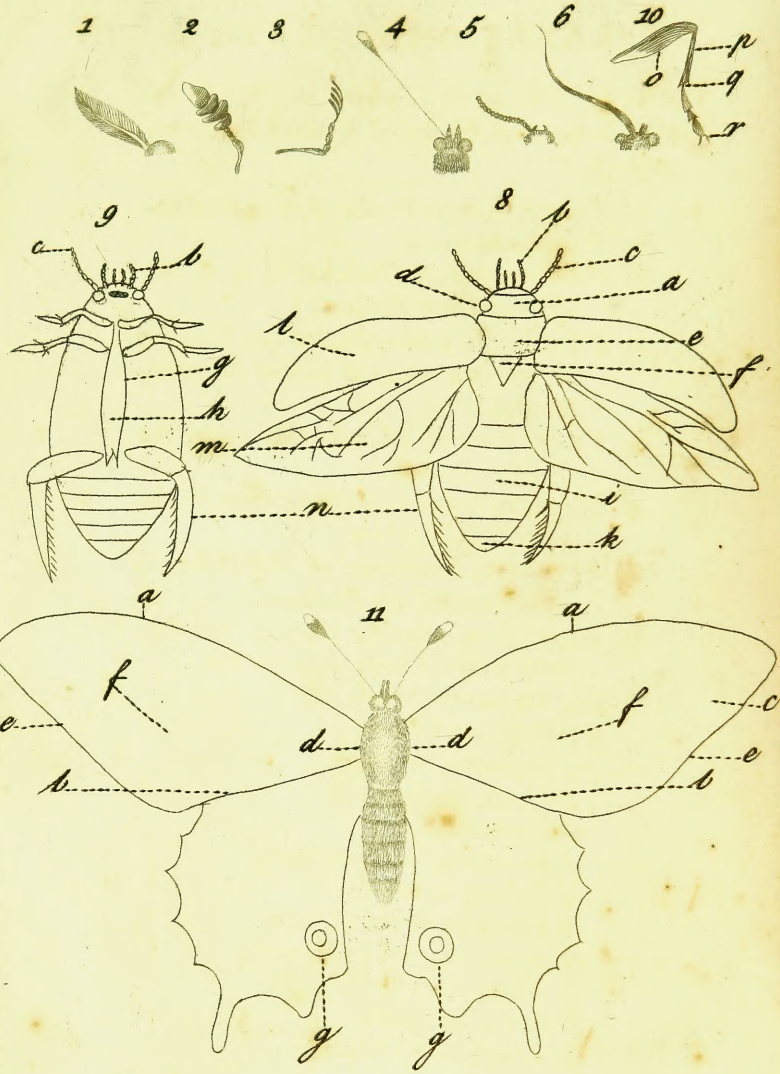
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EXPLANATION of PLATE I.

Fig. 1, 2, 3, 4, 5, 6, in plate i. and fig. 6. in plate ii. repreſent the ſeveral kinds of Antennæ, page 38.

Fig. 1. PECTINATÆ, or Feather'd, as in the *Phalænæ*, *Moths*.

2. PERFOLIATÆ, or Perfoliated, as in the *Dermeſtes* and *Dytiſcus*.

3. FISSILES, or Fiſſile, divided into Laminæ at the extremity, as in the *Scarabæi*, Beetles.

4. CLAVATÆ, or Club-ſhaped, as in the *Papilio*, Butterfly.

5. MONILIFORMES, like a Necklace of Beads, as in the *Chryſomela*.

6. SETACEÆ, Setaceous, or Briſtle-ſhap'd, as in many of the *Phalænæ*.

7. ARISTATÆ, fig. 6, plate ii. furniſhed with a lateral hair, as in the *Fly*.

8-9. *a* Caput, the Head.
b Palpi, or Feelers.
c Antennæ, or Horns.
d Oculi, the Eyes.
e Thorax
f Scutellum, or Eſcutcheon.
g Pectus, or Breaſt.
h Sternum, or Breaſt Bone.
i Abdomen, and its ſegments.
k Anus.
l Elytra, or Shells.
m Membranous Wings.

Fig. 8-9.

Fig. 8-9. *n* Pedes, or Feet, which are Natatorii.

10. *o* Femur, or Thigh.
p Tibia, or Leg.
q Tarſus, or Foot.
r Unguis, or Claw.

11. *a* The Anterior part of the Wing.
b The Poſterior part.
c The Exterior part.
d The Interior part.
e The Margin.
f The Diſk, or Middle.
g Oculus, or Eye.

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EXPLANATION of PLATE II.

Fig. 1, 2, 3, 4, 5, 6, 7, repreſent the claſſes of Inſects, page 70.

Fig. 1. COLEOPTERA, ſuch as have cruſtaceous Elytra, or Shells, which ſhut together, and form a longitudinal ſuture down the back of the inſect, as in the Chafer. In moſt inſects of this claſs the Elytra cover the Abdomen entirely; in others but partially, as in the Earwig, &c. The word is derived from κολεὸς, a Sheath, and πτερὸν, a Wing.

2. HEMIPTERA, have their upper wings moſt commonly half cruſtaceous, and half membranaceous, not divided by a longitudinal ſuture, but incumbent on each other; as in the Water-ſcorpion and Graſshopper. From ἥμισυ, half, and πτερὸν, a Wing.

3. LEPIDOPTERA, have four wings, cover'd with fine ſcales in the form of powder or meal, as in the Butterfly and Moth, from λεπὶς, a Scale, and πτερὸν, a Wing.

4. NEUROPTERA, have four membraneous tranſparent naked wings, generally reticulated, with veins or nerves; tail without a ſting, as in the Libellula or Dragon-fly; from νεῦρον, a Nerve, and πτερὸν, a Wing.

Fig. 5.

5. HYMENOPTERA, have four membraneous wings, tail furniſhed with a ſting for various purpoſes; as in the Waſp and Ichneumon, from ὑμὴν, a Membrane or Pellicle, and πτερὸν, a wing.

6. DIPTERA, Two wings only, and Poiſers, as in the Houſe-fly; from δύω, two, and πτερὸν, a Wing.

7. APTERA, have no wings; as the Spider, &c. from ἀ Without, and πτερὸν, a Wing.

8. 9. 10. 11. repreſent the inſect in its Egg, Caterpillar, Pupa, and Perfect ſtate.

AN INTRODUCTION TO ENTOMOLOGY.

SECTION I.

THE pleaſure and utility of natural hiſtory, including its ſeveral branches, is ſo great, that it has engaged the attention of mankind from the remoteſt period of time: there is ſcarce an age but what has contributed ſomewhat to its increaſe, though in ſome countries it has not been purſued with the like ardour, nor attended with the

ſame ſucceſs as in others. The all-wiſe Author of Nature hath implanted in the mind a peculiar thirſt for knowledge, which however, from the narrow limits of our intellects, and the infinite variety of objects, is not poſſeſt by all in the ſame degree. When this principle is rightly directed, it may juſtly be called a ſpur to wiſdom, otherwiſe it is apt to precipitate us into doubts and uncertainties, and in attempting many and great things we perform nothing. To ſay nothing of other purſuits, would it not have been more reaſonable for the antients, who devoted themſelves to the ſtudy of aſtrology, and the contemplation of celeſtial bodies, at an infinite diſtance, to have inveſtigated the various inhabitants of their own planet, and been more ſolicitous about things which were really known to exiſt, than about

thoſe

thoſe whoſe exiſtence was only probable?

It is the opinion of moſt Theologiſts and Philoſophers, that the two branches of natural hiſtory, zoology and botany, were among the primary ſtudies of our firſt parents. Botany, if we except the times of barbariſm, has every where been cultivated; but zoology in general has lain almoſt neglected, even to our time; that part more particularly which relates to inſects, has, for reaſons we ſhall preſently mention, been deſpiſed and ill treated. As this ſcience is too extenſive to be fully diſplayed by any one perſon, my intention is to propoſe it in as ſhort a manner as poſſible, by running through its principal heads: Inſects exceed other terreſtrial animals in number of individuals and ſpecies, and taken all together, conſtitute a larger

bulk. Notwithſtanding their contemptible appearance, each of them has its proper buſineſs aſſigned to it in the œconomy and police of nature, whereby they frequently tranſact the greateſt things, and though gradually and ſlowly, yet by their number they effect what would appear to exceed all expectation and belief.

SECT. II.

IT was formerly believed that inſects were produced by equivocal generation, or from putrefaction, and that the putrified remains of other animals were changed into them; and that infinite mixtures and varieties might thus ariſe without law or order. This abſurd and futile opinion, almoſt univerſally prevailed 'till the times of Harvey and

and Rhedi, who, from uncontroverted experiments, proved that the ſame laws of propagation exiſted in thoſe as in other animals, and that *every living thing was produced from an egg*. Some of thoſe animals are extremely minute, ſo as to be ſcarce viſible to the naked eye, as ACARI, *(mites)* THRIPES, COCCI, PHALÆNA OCCULTELLA, *(a ſpecies of moth)* others again are very large, as the MONOCULUS POLYPHEMUS, CANCER GAMARUS, *(lobſter)* and ſome others of the crab kind, SCARABÆUS ACTÆON, *(a ſpecies of beetle)* and PHALÆNA ATLAS *(another ſpecies of moth)*. With regard to their ſtrength, conſidering their ſize, it appears prodigious. Excepting aquatic inſects, which are *biennial*, moſt of them are *annual*, and cannot ſubſiſt through the winter in our cold climate; but being renewed every ſpring, they render their ſpecies

peren-

perennial: They multiply incredibly, vying even with the fiſhes in their increaſe. Reaumur informs us, that one female bee can yearly depoſit in the hive forty thouſand eggs; the ſame author alſo diſcovered in one fly two thouſand young ones: their ſtructure, wonderful mechaniſm, and ſhape, diſplay the perfection of the all-wiſe Creator; in the beauty of their colours, they are not inferior to the fineſt animals and flowers, to inſtance the BUPRESTIS *ignita*, PAPILIO, *Priamus*, *Helena*, *Menelaus*, and moſt of the Indian butterflies, and thoſe kind of moths called *Tineæ*. It is therefore matter of admiration that the Engliſh and French nobility, who are curious in this part of natural hiſtory, have not conſtructed hot-houſes for the Indian Lepidoptera, in which they might ſubſiſt during the winter, as they are undoubtedly more

pleaſing

pleaſing to the eye than any other, as appears from the paintings of Clerck and Merian.

SECT. III.

AS inſects furniſh but few of the neceſſaries of life, the ignorant and uncivilized part of mankind have not ſcrupled to ſtigmatize the ingenious enquirers after them with the name of fools, as theſe animals appeared to them altogether contemptible, and deſerved to be conſidered only as puniſhments inflicted on particular countries for the ſins of its inhabitants; forgetting in the mean time that the all-wiſe Creator, who formed them, created nothing in vain, nothing without its uſe. But as mankind became more enlightened, the great wonders of nature in

theſe ſmall animals began to be obſerved; each ſpecies was found to be furniſhed with inſtruments adapted to keep up a proper proportion in the œconomy of nature; happily ſome clear the ſurface of the earth from impure and ſuperfluous, ſome the air of fetid and putrid matters, and others muddy and ſtagnating waters of heterogeneous or filthy mixtures; they aſſiſt in preſerving a due proportion among vegetables, by deſtroying many which are inacceſſible to the larger animals.

Different parts of the ſame plant often afford nouriſhment to different inſects; ſome live on the flowers, as the *Curculiones*; ſome on the roots, as the *Leptura*; and others on the leaves, as the *Phalenæ*; and as the plants increaſe, ſo does the number of their reſpective inhabitants. Laſtly, they carry off

any

any ſuperfluous or noxious humour ſecreted on the ſurface of animals or vegetables; and their influence will probably be found much greater than it is at preſent, when ſocieties, ſimilar to thoſe of Peterſburgh, Paris, London, Leipſic, Gottingen, &c. vying with each other in diſcoveries relating to œconomy of nature, come to be eſtabliſhed in the ſeveral kingdoms and principal cities of Europe. To arrive at a perfect knowledge of this œconomy, every part of the productions of nature muſt be accurately inveſtigated, and conſequently the extenſive province of inſects: for, notwithſtanding their great uſe in the œconomy we have been ſpeaking of, they are oftentimes extremely troubleſome and deſtructive, and with great difficulty got rid off; but if we underſtood how to apply them properly, we might uſe them as

we do cats againſt mice, and by attending to the deſign of nature, prevent much damage. Thus houſe-bugs, the *Phalæna Graminis*, caterpillars which infeſt gardens, with a thouſand others, might eaſily be deſtroyed by their natural enemies. To bring this art to ſome degree of perfection, we muſt become better acquainted with the plants, &c. on which inſects feed, with a variety of other circumſtances, which poſterity perhaps will be happy in the diſcovery of. The great advantages which have accrued to mankind from ſilk-worms and bees, have occaſioned ſo many volumes to be written on them, as would incline one to think the ſubject exhauſted; but there is much room for farther obſervation. D. Lyonett has lately publiſhed 2 vols. in quarto on one inſect, the Phalæna Coſſus, and yet hath ſtill left room for farther

farther contemplation on the ſubject. In the age ſucceeding Swammerdam, the art ſuffered much from the prolixity of writers; the hiſtory of each inſect was delivered in a verboſe and luxuriant ſtile; this is to be avoided; and the neceſſary particulars being aſcertained, our aim in delivering them ſhould be to unite brevity with perſpicuity. The deſcription of thoſe animals is more difficult, as they make their appearance at ſo many different times, and under ſuch a variety of forms; all inſects, except thoſe of the claſs Aptera and the bed-bug, paſſing through three metamorphoſes, in each of which it is neceſſary we ſhould know them. We think our knowledge very conſiderable when we are acquainted with moſt of the inſects of a country in their Fly ſtate, although we are ignorant of one half of their manner of life previous to this

ſtate; and the difficulty of acquiring this knowledge is greater than the inattentive are aware of; to inſtance in the Flea, an inſect we are ſo well acquainted with, and which, like moſt others, undergoes three transformations or changes before it arrives to perfection; yet not one in a thouſand has ſeen it in its caterpillar or chryſalis ſtate. From a conſideration of the many wonders in this part of nature, in order to avoid confuſion, I find it neceſſary, in purſuing what I have farther to ſay on inſects, to follow ſome natural order of ſyſtematic arrangements.

SECT. IV.

In ſtudying any ſcience, the *names* made uſe of therein are firſt to be learnt, without

without which it would become lifeleſs, as we ſhould be deprived of all intercourſe with learned men. Among former Entomologiſts, there were ſome who deſpiſed all ſyſtem, or at leaſt the enumeration and deſcription of the inſects of particular countries; and inſiſted, that the metamorphoſes of inſects were ſolely to be attended to. But certainly method conſtitutes the life of ſcience; and we ſhould in vain ſtudy natural hiſtory, without accurate deſciptions; ſuppoſe, for inſtance, the figures of Reaumur, in his immortal work, in which he illuſtrated this ſcience in a manner ſuperior to all that went before him, to be ſo obſcure and indeterminate as to convey no idea of what he meant to communicate; of what uſe, I pray, would be his infinite diſcoveries? But when the ſpecific name of any inſect is determined, and

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the ſynonymous names of Swammerdam, Reaumur, De Geer, and Roeſel, are annexed, theſe authors may be immediately conſulted; and what has been the work of many ages, and could ſcarce be attained by much reading, may be learned from a ſingle work. Indeed, the ſame confuſion which reigned in botany before ſyſtems were eſtabliſhed, would prevail in this ſcience, unleſs a ſyſtem was formed. I therefore judge it moſt eligible to treat of Entomology in a ſcientific manner; but previous to our entering on this, it will be proper to lay before the young ſtudent ſuch authors as have written on this ſubject.

SECT.

SECT. V.

Authors who have written profeſſedly on inſects are very few; the laſt fifty years have produced nearly double the number of all the preceding ages; and when they began to be treated of ſyſtematically, ſcarce any branch of natural hiſtory had more cultivators, or was purſued with more ardour; among others may be reckoned Linnæus, Reaumur, De Geer, Roeſel, Wilkes, Admiral, Clerk, Ehret, Seba, Harris, Poda, Scopoli, Shultzer, Geoffroy, Gronovius, and Schaeffer. Whereas at the commencement of the laſt century we had not one treatiſe entirely Entomological: but about that period this ſcience began to be cultivated; its progreſs however was very ſlow, 'till ſome painters,

painters, prompted by a deſire of embelliſhing their drawings of flowers, delineated thereon ſome of the moſt beautiful butterflies; and thus it was that Hoefnagel, Goedart, Robert, and at length Albin, were allured to a contemplation of inſects. Swammerdam was the firſt who inveſtigated the interior ſtructure of inſects; in which he was ſo amazingly dextrous, as to demonſtrate the parts in the ſmalleſt animals with equal clearneſs as in the larger. In this the immortal Reaumur made a farther progreſs. Lady Merian was ſo captivated with the ſtudy, as to ſail from Holland to Surinam, chiefly to enquire into and obſerve the metamorphoſes of thoſe exquiſitely fine Butterflies, with which that country particularly abounds, expoſing herſelf with her daughter to all the dangers of

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a tempeſtuous ocean, a moſt ſingular inſtance of her zeal for this ſcience!

The minuteneſs of inſects makes it more difficult to have a proper idea of them by deſcription than by drawings coloured from nature, ſuch as are given us by Goedart, Albin, Roeſel, Wilkes, Admiral, Merian, Clerk, Ehret, Shaeffer, and Harris.

The principal authors who have treated of inſects ſyſtematically, are Linnæus, De Geer, Poda, Scopoli, Shultzer, Geoffroy, Gronovius, and Shaeffer. The exotic or extra European inſects have never been profeſſedly written on, nevertheleſs a great number of them are figured in the following works:

Clerkii Icones inſectorum rariorum.

Merianæ Inſecta Surinamenſia.

Brown's Civil and Natural Hiſtory of Jamaica.

Cateſbey's Natural Hiſtory of Carolina.

Sloane's Natural Hiſtory of Jamaica.

Edwards's Natural Hiſtory of Birds, 2 vols.

——— * Gleanings of Natural Hiſtory, 2 vols.

The beſt authors that have written on particular inſects, beſides innumerable ones on ſilk-worms and bees, are *Liſter*, *Albin*, and *Clerk* de Araneis, *Rhedi* de Pediculis,

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* To theſe authors may be added the *Illuſtrations of Natural Hiſtory*, lately publiſhed in two volumes quarto, by our countryman D. Drury: this work may indeed be conſidered as written profeſſedly on this ſubject, and contains a greater number of exotic inſects, than any other work of the kind.

Thoſe authors to which an aſteriſm is prefixed are added by the tranſlator. And the obſervations he has made on the works of others, are printed in italic letters.

Pediculis, and *Rhumphius* de Cancris Indicis.

A catalogue of the principal authors that have written on inſects, with ſome obſervations on their works:

Mouffet. Inſectorum ſive minimorum animalium theatrum, London 1634, folio. This work was begun by Edward Wotton, in the year 1550, continued by Conrad Geſner, enriched by Thomas Penny, and finiſhed by Mouffet; it is embelliſhed with wooden cuts. *There is a tranſlation of it into Engliſh, by Edward Topſell*, 1658.

Aldrovand. Ulyſſis Aldrovandi animalia inſecta. Bonon. 1602, et 1638, folio; written in a looſe manner, wooden cuts; it alſo contains the inſects of Mouffet.

Johnston. Johannis Johnſtoni Hiſtor. Natural. de inſectis. Frankf.

1653, folio. A plagiary from Aldrovand, with copper plates engraved by himſelf.

HOEFFNAGEL. Jacobi Hoeffnagel Icones inſectorum, 1630, in quarto.

GOEDART. Johannis Goedartii metamorphoſes inſectorum. Mediol. 1662, octavo. This is written in the Dutch language, and the cuts are coloured. *There is alſo an edition of it in French, and likewiſe in Latin, by M. Liſter, with great additions.*

HOOKE. Roberti Hooke Micrographia. London, 1665, folio, tab. 38.

RHEDI. Franciſci Rhedi experimenta. Florent. 1668, quarto. Animalia viva in vivis Florent. 1684, 12mo.

BLANCARD. Stephani Blancardi theatrum inſectorum (Schouburgh van de Rupen) Amſt. 1668, octavo.

SWAMMERDAM. Johannis Swammerdamii hiſtoria inſectorum generalis. Ultraj.

Ultraj. 1669, quarto. Biblia Naturæ Lugd. Batav. 1737, 2 vols. folio.

Lister. Martini Liſteri hiſtor. animal. Angliæ. Londoni 1678, quarto. This work treats principally of the Engliſh ſpiders, and by way of appendix explains ſome plates publiſhed at the end of his edition of Goedart.

Merian. Mariæ Sybillæ Merian Erucarum Ortus. Norimberg 1678, quarto, with cuts coloured, and not coloured. Moſt of the Lepidopteræ here deſcribed are delineated in their caterpillar and chryſalis ſtate. On her return from Surinam, this lady publiſhed her ſplendid work, the Inſecta Surinamenſia, which is ſeldom to be met with coloured.

Lewenhoek. Antonii Lewenhoekii Anatomia. Londini 1687, quarto. Epiſtolæ Delph. 1619, quarto. Microſcopical.

Petiver.

PETIVER. Jacobi Peteveri Muſeum, London 1695, 8vo. without cuts. Gazophylacium 1702, folio, a great number of cuts, and many of exotic inſects.

RAY. Johannis Raii hiſtoria inſectorum. Londini 1720, quarto. This work was publiſhed after the author's deceaſe, and is particularly valuable for the excellent deſcriptions of inſects which it contains.

FRISCH. Johannis Leonardi Friſch deſcriptiones inſectorum (Beſchreibung von inſecten in Teuſchland) Berol. 1720, quarto, 13 parts, 38 plates, with many figures. It is written in the German language, and is a work of great merit.

ALBIN. Eleazar Albin. hiſtoria inſectorum Angliæ, London 1720, quarto. This work contains 100 plates coloured.

—— Hiſ-

——— Hiſtoria Araneorum, London, quarto, table 49.

Bradley. Works of nature by Richard Bradley. London 1721, quarto.

Reaumur. Ren. Ant. Reaumere hiſtoire des inſectes. Paris 1734, quarto, 5 vols. with copper plates.

Linnæus. Carol. Linnæi Equit. ſyſtema naturæ. Lugd. Batav. 1736, folio. Holm. 1767, octavo, with the ſynonymous names of other authors. Fauna Suecica. Holm. 1761, octavo, editio 2da. Muſeum Regina. Holm. 1764. octavo, with deſcriptions.

Roesel. Aug. Johan. Roeſel Inſecten Beluſtigung. Norimb. 1746. 4 vols. plates beautifully coloured.

Wilkes. The Engliſh Butterflies, by Benjamin Wilkes, 4to. 125 plates finely coloured.

De

De Geer. Caroli de Geer Hiſtoire des Inſectes. Holmiæ 1752. 2 vols. 4to. with neat plates.

Admiral. Jacob Admiral Waarmingen. Amſterdam, folio.

Clerk. Caroli Clerkii Icones Inſectorum rariorum. Holm. 1759. 4to. Part I. 16 plates, 61 figures. Part the ſecond. Holm. 1764. 4to. 17 plates, 55 figures. The cuts in this work are elegantly coloured.

Ehret. Icones Plantarum. Lond. folio. Inſects interſperſed.

Poda. Nicol. Podæ Inſecta Græcenſia. Græc. 1761. 8vo. 2 vol. This contains the inſects of Greece, arranged according to the ſyſtem of Linnæus.

Scopoli. Joh. Anth. Scopoli Entomologia Carniolica. Wienn. 1763. 8vo. An enumeration and deſcription of the inſects of Carniola, after the Linnæan ſyſtem. *An excellent book.*

SULTZER. J. H. Sultzer Kenzeiken der Inſecten. Zurich 1761, quarto, 24 plates in the Linnæan manner.

GRONOVIUS. Laur. Theod. Gronovii, Zoophylacii faſciculus ſecundus. Leid. 1764, fol. four plates. After the Linnæan ſyſtem, with ſynonyma and deſcriptions; it contains 600 ſpecies, many of which are foreign.

SEBA. Albert. Sebæ Theſaurus Naturæ, vol. 4. Amſt. 1765, folio, tab. 100.

* GEOFFROY. Hiſtoire abregée des Inſectes qui ſe trouvent aux environs de Paris, 2 tom. 4to. Paris 1762.

SCHAEFFER. Joh. Chriſt. Schaeffer Icones Inſectorum. Ratiſb. 1767, 4to. 100 plates coloured.

* ——— Fundamenta Entomologiæ, quarto, plates coloured.

HARRIS. The Aurelian, or a Natural Hiſtory of Engliſh Inſects, namely

Moths and Butterflies, by Moſes Harris. Lond. folio, cuts coloured, Lond. 1766.

* Brunnich. M. Th. Brunnichii Entomologia ſiſtens Inſectorum tabulas ſyſtematicas, cum introductione et iconibus. Haffniæ 1764. A kind of introduction to the ſtudy of inſects, remarkable for its elegance and conciſeneſs, with an explanatory plate.

* Leche. Novæ Inſectorum Species, quas diſſertationis academicæ loco, preſide Johanne Leche, propoſuit Iſaacus Uddman. Aboæ 1753, 4to. cum figuris.

* Drury. Illuſtrations of Natural Hiſtory, by D. Drury, Engliſh and French, 2 vol. 4to. London 1771. The firſt volume contains a great number of exotic inſects, excellently drawn, coloured, and deſcribed, moſt of which are not figured by any other author; the ſecond volume, which will ſoon

make

make its appearance, conſiſts entirely of non-deſcripts, executed in the ſame maſterly manner.

* Sepp. Beſchouwing der Wonderen Gods in de minſtgeachtte Schepzelen of Nederlandſche Inſecten, 4to. 1762, by Chriſtian Sepp. Amſterdam. This work, which is now publiſhing in numbers in Holland, contains a great number of the more rare moths and butterflies of that country, but which are found in many other parts of Europe. Each inſect is delineated in its egg, caterpillar, chryſalis, and fly ſtate, and executed in a manner which reflects the greateſt honour on the artiſt; we are at a loſs which moſt to extol, the accuracy of the drawing, the delicacy of the engraving, or the ſoftneſs and juſtneſs of the colouring; the whole is finiſhed in a manner exquiſitely beautiful, greatly ſuperior to the paintings even of Roeſel or Merian.

* FORSTER. Novæ Inſectorum Species, centuria prima, octavo, 1771, London. A ſyſtematic deſcription of an hundred ſpecies of inſects found in Great Britain, and elſewhere, not inſerted in the 12th edition of Linnæus's Syſtema Naturæ.

SECT. VI.

As inſects are endowed with the various powers of creeping, flying, and ſwimming, there is ſcarce any place, however remote and obſcure, in which they are not to be found. The great confuſion which appeared to the antients to ariſe from their number, made them never dream of reducing them to any ſyſtem. Swammerdam, that indefatigable enquirer into nature, obſerved that their metamorphoſes were divided

divided by nature into ſeveral ſtates or orders. Their external appearance alſo carried with it ſome mark of diſtinction, ſo that entomologiſts called all thoſe of the Coleoptera claſs, Scarabæi (beetles;) thoſe of the Lepidoptera, Papiliones; and thoſe of the Gymnoptera claſs that had two wings only, Muſcæ (flies;) thoſe of the ſame claſs that had four wings, were called Apes (bees). No farther progreſs was made in the ſyſtematic part of this ſcience till the time of Linnæus. He was the firſt that undertook to determine the Genera, and aſſign them their proper characters in the *Syſtema Naturæ*, and thus reduced this ſcience to a ſyſtematic form. This ſyſtem, in ſubſequent editions, was conſiderably enriched and amended by him, inſomuch that the ſcience of inſects now ſhines forth in its full luſtre. He it was who firſt inſtituted

ſtituted natural Orders, and reduced them into Genera by expreſſive names; determined an infinite number of ſpecies in the Fauna Suecica, and Muſeum Reginæ, collected with incredible pains the ſynonymous names of the various authors who had written on them; and laſtly added their deſcriptions, and the places in which they were to be found. So that the ſyſtem of this illuſtrious author will lead any perſon, without the aſſiſtance of a maſter for the moſt part, eaſily to aſcertain the name of any inſect he may meet with. Before his time ſcarce more than 200 inſects were known; whereas, in the laſt edition of his ſyſtem, he has determined the names of nearly 3000 diſtinct ſpecies. The Syſtematic Naturaliſts, in the more Southern parts of Europe, excited by his example, have diligently inveſtigated the inſects of their reſpective countries,

countries, ſo that we are become pretty well acquainted with the greateſt part of the European inſects in their perfect or fly ſtate. From the inſects collected in the Southern parts of France (more than 300 of which were ſent to our Preſident, by the moſt noble Soubry, Treaſurer of France, reſiding at Lyons) the number of ſpecies was conſiderably increaſed. A cabinet full of the inſects of Barbary was alſo ſent him from the accompliſhed Brander, Conſul at Algiers; and a very conſiderable number from Carolina, in America, was received from the very ingenious Garden, which greatly increaſed the number of Arctic or Northern inſects. Our knowlege of the Tropical or Indian inſects, as they are called, is very limited. The larger ſort of the Lepidoptera, preſerved in the cabinets of the curious, and thoſe collected

lected at Surinam by Rolander, and ſent to the cabinet of De Geer, being the principal of what we are acquainted with. The Antarctic inſects we were totally unacquainted with, excepting thoſe ten which Petiver delineated in his Gazophylacium, till the illuſtrious Tulbagh, Governor of the Cape of Good Hope, ſent a fine collection of them to our learned Preſident. Should the Indian and Antarctic inſects ever come to be pretty generally known, they will doubtleſs vie with plants in number, though they will probably never attain to the number which Muſchenbroek apprehended in his Oration.

SECT.

SECT. VII.

Whoever is desirous of attaining a systematic knowledge of insects, ought primarily to be solicitous about acquiring the terms made use of in the science, that so he may be able rightly to denominate every part of an insect. This then, as the first rudiments of the science, we shall begin with. The student is first to know what an insect is, lest he mistake hippocampi, and other amphibious animals, for them, as was formerly done, or confound them with the vermes, which Linnæus first distinguished from insects, and which differ as essentially from them as the class mammalia do from birds. Every insect is furnished with a head, antennæ, and feet, of all which the vermes are destitute. All insects have six or more feet; they

reſpire through pores placed on the ſides of their bodies, and which are termed ſpiracula; their ſkin is externally hard, and ſerves them inſtead of bones, of which they have internally none. From this definition, the acus marina is evidently no inſect. But the antennæ placed on the fore part of the head, conſtitute the principal diſtinction. Theſe are jointed and moveable in every part, in which they differ from the horns of other animals; they are organs conveying ſome kind of ſenſe; but we have no more idea what this kind of ſenſe is, than a man has, who, without eyes, attempts to determine the particular action of the rays of light on the retina of the eye, or to explain the changes which from thence take place in the human mind. That they are the organs of ſome kind of ſenſe, is apparent from their perpetually moving them forward; yet

yet the hard cruſt with which they are inveſted, and their ſhortneſs in flies and other inſects, would induce one to believe them not to be the organs of touch: that they are tubular, and filled with air, and ſome kind of humour, appears from the antennæ of butterflies immerſed in water. To come now to the terms of the art. A knowledge of the external parts of the body is firſt to be eſtabliſhed, which, after the method of anatomiſts, we divide into head, trunk, abdomen, and extremities.

SECT. VIII.

Caput, the head. This part in inſects is without brain. The difference between the brain and ſpinal marrow conſiſts in the former being a medullary part organized. We do not deny the

exiſtence of a medullary thread in the heads of inſects, but we never could diſcover it to be organized; hence the hippoboſca equina, or horſe fly, will live, run, nay even copulate, after being deprived of its head; to ſay nothing of many others which are capable of living a long while in the ſame ſituation. As they are not furniſhed with ears, we apprehend them incapable of hearing; as we can no more conceive that ſenſe to exiſt without ears, than viſion without eyes. They are nevertheleſs ſuſceptible of any ſhrill or loud noiſe, as well as fiſhes, but in a manner different from that of hearing. We are alſo dubious if they have the ſenſe of ſmell, no organ being found in them adapted to that purpoſe; they nevertheleſs perceive agreeable and fetid effluvia, but in a manner wholly unknown to us. Many inſects have no tongue, nor make

any

any ſound with their mouth; but for this purpoſe, ſome uſe their feet, others their wings, and others, ſome elaſtic inſtrument with which they are naturally furniſhed. Moſt inſects have two eyes, but the gyrinus has four, the ſcorpion ſix, the ſpider eight, and the ſcolopendra three. They have no eyebrows, but the external tunic of their eyes is hard and tranſparent like a watch-glaſs; their eyes have no external motion, unleſs it be in the crab. They conſiſt for the moſt part of one lens only; but in thoſe of the butterfly, dipteræ, and many of the beetles, they are more numerous. Pugett diſcovered 17,325 lenſes in the cornea of a butterfly, and Lewenhoek, 800 in a fly.

Antennæ, *plate* 1. *a.* Theſe are in general two (unleſs 4 are allowed to ſome kind of crabs) and placed on the fore-

fore-part of the head; they are peculiar to inſects, and are plainly diſtinguiſhable from the tentaculæ of the vermes in being cruſtaceous; and from the palpi of inſects, which are more numerous, placed near the mouth, and are ſometimes wanting. As the antennæ are of great moment in diſtinguiſhing the various kinds of inſects, we ſhall enumerate and explain the ſeveral different forms of them.

Setaceæ, are thoſe which grow gradually taper towards the extremity, as in plate 1. fig. 6.

Filiformes, ſuch as are of the ſame thickneſs throughout.

Moniliformes, are filiform, like the preceding, but conſiſt of a ſeries of round knobs, like a necklace of beads, as in plate 1. fig. 5.

Clavatæ,

Clavatæ, ſuch as gradually increaſe in ſize toward the extremity, as in plate 1. fig. 4.

Capitatæ, are *clavatæ*, but have the extremity ſomewhat round.

Fiſſiles, are *capitatæ*, but have the capitulum, or knob, divided longitudinally into 3 or 4 parts, or laminæ, as in the ſcarabæi, plate 1. fig. 3.

Perfoliatæ, are alſo *capitatæ*, but have the capitulum horizontally divided, as in the dermeſtes, plate 1. fig. 2.

Pectinatæ, ſo called from their ſimilitude to a comb, though they more properly reſemble a feather, as in the moths and elateres. This is moſt obvious in the male, plate 1. fig. 1.

Ariſtatæ, ſuch as have a lateral hair, which is either naked or furniſhed with leſſer hairs, as in the fly, plate 2. fig. 6.

Breviores,

Breviores, thoſe which are ſhorter than the body.

Longiores, thoſe which are longer than the body.

Mediocres, thoſe which are of the ſame length with the body; all three of which varities are diſtinguiſhable in the cerambyces.

Palpi, or feelers, ſo firſt named by Linnæus, reſemble filiform, articulated, moveable antennæ. They are moſt commonly four in number, ſometimes ſix; they are ſufficiently diſtinguiſhed from antennæ, in being naked, ſhort, and always placed at the mouth, ſee plate 1. fig. 6.

Os, the Mouth, is generally placed in the anterior part of the head, extending ſomewhat downwards. In ſome inſects, it is placed under the breaſt, as in the chermes, coccus, cancer, (crab) and curculio.

Roſtrum,

Roſtrum, or Proboſcis, is the mouth drawn out to a rigid point: in many of the hemiptera claſs it is bent downward toward the breaſt and belly, as in the cicada, nepa, notonecta, cimex, (bug) aphis, and remarkably ſo in ſome curculiones.

Maxillæ, the Jaws, are two in number, ſometimes four, and at other times more; they are placed horizontally; the inner edge of them in ſome inſects is ſerrated, or furniſhed with little teeth.

Lingua, the Tongue, in ſome inſects is taper and ſpiral, as in the butterfly; in others it is fleſhy, reſembling a proboſcis; and tubular, as in the fly.

Labium Superius, the upper Lip, this is ſituated above the jaws, as in the ſcarabæus and gryllus.

Stemmata, or Crown, are three ſmooth hemiſpheric dots, placed generally on the top of the head, as in moſt of the hymenoptera, and others; the name was firſt introduced by Linnæus.

* * Truncus, the Trunk, is that part which comprehends the breaſt or thorax; it is ſituated between the head and abdomen, and has the legs inſerted into it, that its parts may be diſtinctly determined; it is divided into *Thorax*, *Scutellum*, and *Sternum*.

Thorax, the Thorax, (plate 1. *c.*) is the back part of the breaſt; it is very various in its ſhape, and is called *Dentatus*, when its ſides are armed with points; *Spinoſus*, when its back is furniſhed with them, as in the cerambyx; and *Marginatus*, having its margin laterally dilated, as in the ſilpha and caſſida.

Scutellum,

Scutellum, or Eſcutcheon, (plate 1. *d.)* is the poſterior part of the thorax; it is frequently triangular, and appears to be divided from the thorax by an intervening ſuture, as in moſt of the coleoptera.

Sternum, the Sternum, is ſituated on the inferior part of the thorax; it is pointed behind in the elateres, and bifid in ſome of the dytiſci.

Abdomen, the Abdomen, (plate 1. *e.)* is in moſt inſects diſtinct from the thorax; it is the poſterior part of the body of the inſect, and is compoſed of a number of annular ſegments, which ſerve occaſionally to lengthen or ſhorten it, and to contain the organs of chylifaction, &c.

Spiracula, are little holes or pores, placed ſingly on each ſide of every ſeg-

ment of the abdomen; through theſe the inſect breathes; and if oil be applied ſo as to ſtop them up, it proves fatal to moſt of them.

Tergum, the Back, is the ſuperior part of the abdomen.

Venter, the Belly, is the inferior part.

Anus, is the poſterior part of the abdomen, perforated for the evacuation of the excrement. This part alſo frequently contains the organs of generation.

*** Artus, the limbs, are the various inſtruments of motion.

Pedes, the Legs, are generally ſix; there is an exception to this, however, in the claſs Aptera, many of which have eight, as Acari (Mites) Phalangii; moſt of the Aranei, (Spiders) Scorpiones

piones, (Scorpions) and Cancri (Crabs.) The Oniſcus has 14, and the Juli and Scolopendri ſtill more.

The firſt joint of the leg, which is generally thickeſt, is called *Femur* (plate 1. *f.*) the ſecond, which is generally of the ſame ſize throughout, *Tibia*, *(g.)* the third, which is jointed, is diſtinguiſhed by the name of *Tarſus (h.)*; and the laſt, which in moſt inſects is double, by that of *Unguis (i.)*. The legs of inſects, in general, are named from the various motions they produce:---

Curſorii, from that of running, which are the moſt numerous; *Saltatorii*, from that of leaping; *Natatorii*, from that of ſwimming, &c.

In the *Saltatorii*, the thighs are remarkably large, by which means they are able to leap to a conſiderable diſtance, as in the Gryllus, (Graſshopper) &c. In thoſe of the *Natatorii*, the feet are flat, and edged with hairs, which anſwer the purpoſe of oars in aſſiſting them to ſwim, as in the Dytiſcus.

Mutici, are ſuch feet as have no claws.

Chelæ, or Claws, are the fore-feet enlarged towards their extremities, each of which is furniſhed with two leſſer claws, which act like a thumb and finger, as in the Crab.

Alæ, Wings, theſe are the inſtruments which enable them to fly; they are membranous, and undivided, except in the inſtance of the Phalænæ Alucitæ, in which they are in part divided:

vided. Moſt inſects have four; the Diptera-claſs, and the Coccus, however, have two only.

The wing is divided into its *ſuperior* and *inferior* ſurfaces; its *anterior* part (ſee explanation of plate 1.) in a butterfly, is that towards the anterior margin, or next to the head; its *poſterior* part, that towards the Anus; its *exterior* part, that towards the outer edge; and the *interior*, that next the Abdomen.

They are called *plicatiles*, when they are folded at the time the inſect is at reſt, as in the waſp; oppoſite to theſe are the *planæ*, which are incapable of being folded.

Erectæ, ſuch as have their ſuperior ſurfaces brought in contact when the inſect is at reſt, as in the Ephemera, Libellula Puella, and Virgo, and Papiliones, (butterflies.)

Patentes,

Patentes, which remain horizontally extended when the inſect is at reſt, as in the Phalænæ Geometræ, and moſt of the Libellulæ.

Incumbentes, ſuch as cover horizontally the ſuperior part of the abdomen when the inſect is at reſt.

Deflexæ, are Incumbentes, but not horizontally, the outer edges declining toward the ſides.

Reverſæ, are Deflexæ, with this addition, that the edge of the inferior wings projects from under the anterior part of the ſuperior ones.

Dentatæ, in which the edge is ſerrated, or ſcolloped.

Caudatæ, in which one or more projections in the hinder wings are extended into proceſſes.

Reticulatæ, when the veſſels of the wings put on the appearance of net-

work,

work, as in the Hemerobius Perla; the two anterior wings generally become *ſuperior*, and the poſterior ones *inferior*, in Moths, when their wings are cloſed; but the anterior wings are called *primary*, and the inferior ones *ſecondary*, in butterflies, as they cannot with propriety be called inferior when the wings are erect.

Colores, the *Colours*, theſe are ſelf-apparent; but according to their ſeveral ſhapes, they take the different names of *Punctæ*, *Dots*; *Maculæ*, *Spots*; *Faſciæ*, *Bands*; which frequently run acroſs, and ſometimes ſurround the edge of the wings. *Strigæ*, *Streaks*, are very ſlender, Faſciæ; and *Lineæ*, Lines, which are longitudinally extended.

Ocellus, is a round ſpot, containing a leſſer ſpot of a different colour in its center.

Stigmata, another term lately introduced by Linnæus, ſignifies the ſpot, or anaſtamoſis, in the middle of the wing near the anterior margin; it is conſpicuous in moſt of the Hymenoptera and Neuroptera, and even in the Coleoptera. The ſingle or double kidney-ſhaped ſpot, ſituated in the ſame part of the anterior wings, and frequently occurring in the Phalænæ Paganæ, is diſtinguiſhed likewiſe by the name of *Stigma*.

Elytra, (in the ſingular number Elytron) the Upper Wings, which are of a hard ſubſtance, in ſome degree reſembling leather, and which in moſt inſects are of a very hard texture, but in others flexible, are called Elytra; their ſuperior ſurface is generally convex,

vex, their inferior one concave. When the inſect flies they are extended, and ſhut when it reſts, cloſing together, and forming a longitudinal ſuture down the middle of the back, as in the Coleoptera.

They are of various ſhapes.

Abbreviata, when ſhorter than the Abdomen.

Truncata, when ſhorter than the Abdomen, and terminating in a tranſverſe line.

Faſtigiata, when of equal, or greater length than the Abdomen, and terminating in a tranſverſe line.

Serrata, when the exterior margin towards the apex is notched or ſerrated, as in ſome of the Bupreſtes.

Spinoſa, when their ſurface is covered with ſharp points, or prickles.

Scabra, when their ſurface is ſo uneven as to grate againſt the fingers.

Striata, when marked with ſlender longitudinal furrows.

Porcata, when with elevated longitudinal ſulci, or ridges.

Sulcata, when theſe ridges are concave.

Hemelytra, when the ſuperior wings are of a middle ſubſtance betwixt leather and membrane; either totally ſo, as in the Grylli; or partially ſo, as in the Cimices, Nepæ, and Notonectæ. Theſe are commonly diſtinguiſhed by the name Hemiptera.

Halteres, Poiſers, (a term alſo introduced by Linnæus) are little heads placed on a ſtalk or peduncle, moſt frequently under a little arched ſcale. They are found only in the claſs Diptera, and appear to be nothing more than the rudiments of the hinder wings.

Cauda, the tail, in moſt inſects is,

Simplex,

Simplex, ſimple, capable of being extended, and again drawn back at pleaſure; in the Crab and Scorpion, however it is,

Elongata, elongated, or lengthened out.

Setacea, briſtle-ſhaped, or taper, as in the Raphidia.

Triſeta, conſiſting of three briſtles, as in the Ephemera.

Furcata, being forked, as in the Podura.

Forcipata, reſembling a pair of forceps, as in the Forficula.

Folioſa, reſembling a leaf, as in the Blatta, Grylli, and ſome ſpecies of Cancri.

Telifera, ſuch as are armed with a dart or ſting, as in the Scorpion and Panorpa.

Aculeus, an inſtrument with which they wound, and at the ſame time inſtill

ſtill a poiſon; with ſuch the Bee, Waſp, Scorpion, &c. are furniſhed.

Sexus, the Sex. The ſame difference of ſex exiſts in inſects as in other animals, and they even appear more diſpoſed to increaſe their ſpecies than other animals; many of them, when become perfect, ſeeming to be created for no other purpoſe but to propagate their ſpecies. Thus the ſilk-worm, when it arrives at its perfect or Moth-ſtate, is incapable of eating, and can hardly fly: It endeavours only to propagate its ſpecies; after which the male immediately dies, and the female, as ſoon as ſhe has depoſited her eggs.

In many inſects, the male and female are with difficulty diſtinguiſhed; and in ſome they differ ſo widely, that an unſkilful perſon might eaſily take the male, and female, of the ſame in-

ſect

ſect for different ſpecies; as for inſtance, in the Phalæna Humuli, Piniaria, Ruſſula; each ſex of which differs in colour. This unlikeneſs is ſtill more apparent in ſome inſects, in which the male has wings, and the female none, as in the Coccus, Lampyris, Phalæna Antiqua, Brumata, Lichenella. And as moſt inſects remain a long while in copulation, as we may ſee in the Tipula, and Silk-worm; the winged males fly with the wingleſs females, and carry them about from one place to another, as in the Phalæna Antiqua. It is, however, no certain rule, that when one inſect of the ſame ſpecies is found to have wings, and the other to be without, the former muſt neceſſarily be the male, and the latter the female. The Aphides, for inſtance, are an exception; and beſides theſe, individuals of both ſexes, and of the ſame ſpecies, are

are found without wings, as the Carabi Majores, Tenebriones, Meloes, Cimices. The Gryllus Pedeſtris is likewiſe deſtitute of wings, and might have paſſed for a Gryllus in its pupa ſtate, had it not been ſeen in copulation; for it is well known that no inſect can propagate its ſpecies, till it arrives at its laſt or perfect ſtate.

" Pleraque inſectorum genitalia ſua " intra anum habent abſcondita, et pe- " nes ſolitarios, ſed nonnulla penem " habent bifidum: Cancri autem et " Aranei geminos, quemadmodum non- " nulla amphibia, et quod mirandum " in loco alieno, ut Cancer, ſub baſi " caudæ. *Araneus mas* palpos habet " clavatos, qui penes ſunt, juxta os " utrinque unicum, quæ clavæ ſexum " nec ſpeciem diſtinguunt; et Fœmina " vulvas ſuas habet in abdomine juxta " pectus;

" pectus; heic vero ſi unquam vere
" dixeris: res plena timoris amor, ſi e-
" nim procus in auſpicato acceſſerit, fœ-
" mina ipſum devorat, quod etiam fit,
" ſi non ſtatim ſe retraxerit. Libellu-
" la fœmina genitale ſuum ſub apice
" gerit caudæ, et mas ſub pectore, adeo
" ut cum mas collum fœmina forcipe
" caudæ arripit, illa caudam ſuam pec-
" tori ejus adplicet, ſicque peculiari ra-
" tione connexæ volitent."

Beſides theſe of the male and female, a third ſex exiſts in ſome inſects, which we call *Neuter*: As theſe have not the diſtinguiſhing parts of either ſex, they may be conſidered as eunuchs or infertile.

We know of no inſtance of this kind in any other claſs of animals, nor in vegetables, except in the claſs Syngeneſiæ, and in the Opulus. This kind of

ſex is only found among thoſe inſects which form themſelves into ſocieties, as Bees, Waſps, and Ants; and here theſe kind of eunuchs are real ſlaves, as on them lies the whole buſineſs of the œconomy, while thoſe of the other ſex are idle, only employing themſelves in the increaſe of the family. Each family of bees have one female only (called the queen) many males, and an almoſt innumerable quantity of Neuters. Of thoſe, the Neuters (whoſe antennæ have eleven joints) do the working part; they extract and collect honey and wax, build up the cells, keep watch, and do a variety of other things. The males, whoſe antennæ conſiſt of 15 joints, do no work; they ſerve the female once, and that at the expence of their lives; they may be conſidered in the light of a ſet of Paraſites, or Ceciſbei; but as ſoon

as

as their buſineſs of impregnation is over, they are expelled by their ſervants the neuters, who now ſhake off the yoke, but yet pay all due reſpect to their common mother the queen. The ſame œconomy nearly takes place in Waſps, where the young females, which are impregnated in the autumn, live through the winter, and in the ſpring propagate their ſpecies; but the queen, together with all the males, periſh in the winter.

Among ants, the neuters form a hill in the ſhape of a cone, that the water may run off it, and place thoſe which are in the pupa ſtate, on that ſide of it which is leaſt expoſed to the heat of the ſun. At a conſiderable diſtance from theſe are found the habitations of the males, and females, to whom the moſt ready obedience is yielded by the neu-

ters, till a new off-ſpring ſucceeds, and then they oblige them to quit their habitations. But thoſe ants which live entirely under ground, provide better for themſelves in this reſpect; for a little before their nuptials, they quit their habitation of their own accord, and after ſwarming in the manner of bees, they copulate in the air; and each retiring to ſome new habitation, founds a new family.

No hermaphrodites have as yet been diſcovered among inſects. There is ſomething very ſingular, however, in the propagation of the Aphides. A female Aphis once impregnated, can produce young, which will continue to produce others without any freſh impregnation, even to the 5th progeny; afterwards a new impregnation muſt take place.

The

The male inſects, like male Hawks, are always ſmaller than the females.

In the propagation of their ſpecies they are remarkably careful, ſo that it is with the greateſt difficulty that flies are kept from depoſiting their eggs on freſh meat; the cabbage Butterfly from laying them on cabbage, and other inſects from depoſiting them in the ſeveral places peculiar to each. The Scarabæus Pilularius and Carnifex, are deſerving of our attention, as they afford a mutual aſſiſtance to each other; for when the female has laid her eggs in a little ball of dung, the males, with their feet, which are axiform, aſſiſt the female to roll it to ſome ſuitable place, as Ariſtotle and Pliny formerly, and Loefling has lately obſerved.

It is very wonderful to obſerve, that in the Coccus and Oniſcus, the female has no ſooner brought forth her young,

young, than ſhe is devoured by it; and that the Sphex ſhould be able ſo readily to kill the caterpillar of a Moth, then bury it in the earth, and there depoſited her eggs in it. Nor can we without admiration behold the ſame ſpecies of Aphis, which was viviparous in the ſummer, become oviparous in the autumn.

Almoſt innumerable examples might be brought of the ſingularities in the eggs of inſects; we ſhall, however, only mention thoſe of the Hemerobius, which are depoſited on a footſtalk; thoſe of the Phalæna Neuſtria, which are placed regularly in a ring round the branch of ſome tree, and the compound eggs of the Blatta.

Metamorphoſis. There are no inſects, except thoſe of the Aptera claſs, but what are continually undergoing ſome transformation.

transformation. This renders the ſcience much more extenſive, but at the ſame time is greatly conducive to finding out the natural orders. Inſects change firſt from the (Ovum) egg into the (Larva) Caterpillar or Maggot, then into the (Pupa) or Chryſalis, and laſtly into the (Imago) Fly or Perfect ſtate. [See plate 2.] During each of thoſe changes, their appearance differs as much as night and day.

The inſect, as ſoon as it came out of the egg, was by former entomologiſts called Eruca; but as this is ſynonymous with the botanic name Siſymbrium, it was changed by Linnæus, for the term Larva, a name expreſſive of the inſect's being in this ſtate, as it were, maſked, having its true appearance concealed. Under this maſk or ſkin the intire inſect, ſuch as it afterwards

appears

appears when perfect, lies concealed, inveloped only in its tender wings, and putting on a ſoft and pulpy appearance; inſomuch that Swammerdam was able to demonſtrate the Butterfly with its wings to exiſt in a Caterpillar, though it bore but a faint reſemblance to its future perfection. The inſect, therefore, in this ſtate, undergoes no other alteration but the change of its ſkin.

The Larvæ are, for the moſt part, larger than the inſect when perfect, and are very voracious. The Caterpillar of the cabbage Butterfly eats double what it would ſeem to require from its ſize; but its growth is not adequate to its voracity.

Pupa. The inſect in this ſtate was formerly called Chryſalis, or Aureſia; but as the appearance of gilding is confined to a few Butterflies only, the term of Pupa has been adopted in its ſtead, becauſe

becauſe the Lepidoptera, eſpecially, reſemble an infant in ſwaddling clothes; and in this ſtate all, except thoſe of the Hemiptera claſs, take no nouriſhment.

Imago, is the third ſtate. This name is given by Linnæus to this third change, in which the inſect appears in its proper ſhape and colours; and as it undergoes no more transformations it is called perfect. In this ſtate it flies, is capable of propagating its ſpecies, and receives true antennæ; which before, in moſt inſects, were ſcarce apparent.

As the ſhape of the Pupa is different, in different claſſes of inſects, it aſſumes different names; thus it is called,

Coarctata, when it is round, and as it were turned, without the leaſt reſemblance of the ſtructure of the inſect, as in the Diptera.

Obtecta, when it conſiſts as it were of two parts, one of which ſurrounds the head and thorax, and the other the abdomen.

Incompleta; in this they have wings and feet, but are not capable of moving them, as in moſt of the Hymenoptera.

Semicompleta; theſe walk or run, but have only the rudiments of wings.

Completa, in which they immediately obtain the perfect form of the inſect, without undergoing any more change, as in thoſe of the Aptera claſs, except only the Flea.

The *Bed Bug* alſo belongs to this claſs.

The *Spider* undergoes frequent transformations, though only in the colour of its ſkin. The cruſtaceous inſects, as *Crabs*, *Lobſters*, &c. yearly caſt their ſhells,

ſhells, as their growth would otherwiſe be impeded.

The *Scolopendri*, when young, have fewer feet than when they are full grown.

All inſects, as ſoon as they undergo the third change, are arrived at their full growth; nor do we find any difference in the ſize of the ſame ſpecies of inſect in the ſame countries, unleſs, during its caterpillar ſtate, it has not had a ſufficiency of proper food.

Swammerdam divided inſects, in reſpect of their transformations, into four claſſes;

The *Firſt* contained either ſuch as ſpring from an Egg, as the *oviparous*; or ſuch as are perfect at their firſt production, called *viviparous*, as the Bug, and thoſe of the Aptera claſs.

The *Second* conſiſted of ſuch inſects as are furniſhed with ſix feet, but have

their wings for a certain time concealled under a cruſtaceous ſkin or covering, which covering being caſt off, they become compleatly winged. Such is the Gryllus.

The *Third* claſs included ſuch as paſs through three ſeveral ſtages, and which, upon turning to the Chryſalis ſtate, evidently caſt off a coat or ſkin. In this claſs were two diviſions: the firſt comprehended ſuch as in the Chryſalis ſtate have viſible feet and wings, which were called *Nymphæ*, as Bees; the ſecond ſuch as in the ſame ſtate have their feet and wings covered or inviſible. Theſe were ſpecially termed *Chryſalides*, as Butterflies.

The *Fourth* claſs contained thoſe inſects, which in changing to their Chryſalis or Nympha ſtate, do not caſt their outer coat or ſkin; but their bodies

ſhrink ing

ſhrinking from it, it ſurrounds them like an Egg-ſhell, and is detached from the inſect itſelf, while it continues in this ſtate, till at length it burſts, and excludes it completely winged. Such is the caſe with many Flies.

The claſſes of *Valiſnerus* are taken from the plants, waters, earths, animals, and the other habitations of inſects.

Reaumur's ſyſtem of the Caterpillars of Butterflies, is founded on the ſituation and number of their middle feet, which are inſerted into the circular or oval rings under the body; paying a regard at the ſame to the ſix anterior horny and poſterior membranous feet.

SECT. IX.

HAVING obſerved the nature of inſects in their ſeveral ſtates, it remains that we conſider them ſyſtematically.

matically. A judicious claſſification of them gives life and ſpirit to the ſcience, and makes each inſect as it were declare its own name. For this part we are entirely indebted to Linnæus, who firſt reduced them into certain genera, by giving them diſtinct characters.

The claſſes of inſects are ſeven:

1. *Coleoptera*, have cruſtaceous Elytra, which join together, and form as it were a longitudinal ſuture down the back of the inſect. (See explanation of plate 2.)

2. *Hemiptera*, have moſt commonly their upper wings cruſtaceous at the baſe, or of a middle ſubſtance between Elytra, which are of a coriaceous, and ſoft wings, which are of a membranous texture. The upper wings do not meet by any longitudinal ſuture, and the mouth

mouth is either ſituated in the breaſt, or inclining to it.

3. *Lepidoptera*, have four farinaceous wings, which are covered with very fine ſcales laid over one another. In the mouth is contained a ſpiral tongue, or at leaſt the rudiments of one.

4. *Neuroptera*, have four membranaceous tranſparent wings (not farinaceous.) They are with difficulty diſtinguiſhed from the Hymenoptera by deſcription; but having been once ſeen, they are eaſily known. The tail, therefore, in theſe inſects, being without ſting, we make uſe of it the more eaſily to diſtinguiſh this order.

5. *Hymenoptera*. Theſe, beſides having four membranaceous wings, have their tail armed with a ſting; which, however, is not always made uſe of to inſtil poiſon, but frequently to pierce the

the bark and leaves of trees, and the bodies of other animals, in which it depoſits its eggs, as in the Cynips, Tenthredo, Ichneumon, &c.

6. *Diptera.* This order is eaſily diſtinguiſhed from the others, the inſects of it having two wings, inſtead of four; but principally by their Halteres or Poiſers, a diſtinction which excludes the male Coccus from this order.

7. *Aptera*, is diſtinguiſhed by having no wings at all.

SECT X.

THESE claſſes are again ſubdivided into different orders:

The *Coleoptera*, are diſtinguiſhed according to the ſhape of their antennæ, which are either *filiformes*, *clavatæ*, or *ſetaceæ*.

The

The *Hemiptera* are divided into two orders; 1ſt. thoſe whoſe mouth is furniſhed with jaws, or, 2d. formed of a beak, which is either reflected under the mouth, or placed in the breaſt.

The *Lepidoptera*, according to the ſhape of their antennæ.

The *Neuroptera*, according to the mouth's having no teeth, having many jaws, having two teeth, or being formed into a beak.

Hymenoptera, according to the ſting being either venomous, or harmleſs.

Diptera, into thoſe which have beaks, and thoſe which have none.

Aptera, according to the number of their feet.

To inſert here the *characters* of all the different *genera* which may be found in Linnæus's Syſt. Nat. would be unneceſſary. It will be ſufficient to enumerate ſome new *genera* mentioned by the moſt

modern ſyſtematic writers, that by being acquainted with the ſubtil diſtinctions on which they are built, the ſtudent may avoid running into confuſion. It is among the moderns only that genera of this kind are to be met with, and new names given them. To remove this difficulty, we ſhall firſt enumerate the names of thoſe authors which are ſynonimous with thoſe of Linnæus.

New genera of authors ſynonimous with theſe of Linnæus.

Linnæus's Names.	*Names of other Authors.*
Lucanus	*Platyceros*
Hiſter	*Attelabus*
Byrrhus	*Anthrenus Ciſtela*
Mylabris	*Laria* Scop.
Attelabus	*Clerus*
Silpha	*Peltis*
Bruchus	*Mylabris*

Ptinus

Ptinus	*Byrrhus*
Chryſomela	*Galericula*
Hiſpa	*Crioſeris*
Cantharis	*Cicindela*
Bupreſtis	*Cucujus*
Carabus	*Bupreſtis*
Myrmeleon	*Formicaleo*
Sirex	*Uroceros*

New Genera of Authors.

Copris. Scarabæus abſque ſcutello

Boſtricius. Dermeſutes capecinus

Ciſtela. Byrrhus Pilula

Rhinomancer. Attelabus roſtro producto fere Curculionis

Anthribus. Silpha

Bruchus. Ptinus Fur ob ſpinas thoracis

Melolontha. Chryſomela cylindrica

Altica. ——— ſaltatoria

Diaperis. ——— Fungorum

Pyrochora. Cantharis

Telephorus. Cantharis

Cantharis. Meloë Alata
Cerocoma. Meloë Shafferi
Notaxis. Meloë Monoceros
Prionus. Cerambyx thoracis margine denticulato
Stenocoris. Leptura thorace ſpinoſa
Hydrophilus. Dytiſcus antennis clavatis
Mylabris. Necydalis minor
Acridium. Gryllus Muticus
Locuſta. ——— Tettigonia
Tettigonia. Cicada
Corixa. Notonecta.
Naucoceris. Nepa
Perla. Hemerobius cauda biſeta
Libelluloides. Myrmeleon antennis capitatis
Crabro. Tenthredo antennis clavatis
Pterophorus. Phalæna Alucita
Bibio. Tipula thorace ſpinoſo
Stomoxoides. Aſilus bucca inflata
Strationymus. Muſca

Nemotelus.

Nemotelus. Muſca
Volucella. Muſca.

Theſe genera appear to us to be in a great meaſure like thoſe which were introduced into botany by the followers of Rivinus. Paying too little regard to nature, they diſunited natural genera, on account of the moſt trifling diſtinctions. This made their continuance in the ſcience of very ſhort duration; our buſineſs here is not to ſuppoſe, but to examine, what nature will allow of, and what ſhe will not. Knowledge of this kind, built on opinion only, will not ſtand. We are therefore to look into the ſcience with great accuracy; and the Larva of the inſect, its manner of changing, and other things of moment, are to be known, before we preſume to form a new genus, as men of experience will readily admit. Daily experience in botany teaches us that none are more apt

to

to form new genera, than thoſe who are the leaſt qualified for it.

Coining of new names, and changing of one old one for another, has been the ſource of the greateſt confuſion. Thus, in order to reduce the *Cicindela* and *Carabus* to the ſame genus, *Bupreſtis* has been adopted for the generic name; but as that genus had long ago received a very different application, it was changed for that of *Cucujus*.

Again, that the *officinal Cantharides* might be ranged among the Cerambyces, the *Cantharides* have been removed from the genus of *Meloë* (to which they naturally belong) and referred to the genus of *Cicindela*; obtaining thus a new name, and ſo of many others.

Thus, alſo, to mention no more, how needleſs and raſh was it to ſeparate the *Acridium* and *Locuſta* from the genus

nus of *Gryllus*, the *Crabro* from the *Tenthredines*, and the *Mylabris* from the *Necydalis!*

SECT. XI.

THE trivial names placed under their reſpective genera will occaſion little or no controverſy; they are current like money, and of the ſame utility as the proper names of men, Peter or Paul, &c. Inſects living on vegetables ſhould receive their names from the particular plants on which they moſtly feed, as they are preferable to all others. Thus the names of the *Phalæna mori*, &c. are excellent; and when we are able to give ſuch to inſects, the old ones are to be diſcarded. But we are to be cautious of not being too haſty in our judgment in this reſpect, as inſects, when they cannot get their favourite

vourite food, will often eat other plants. Thus the Silk-worm, for want of mulberry leaves, will eat thoſe of lettuce, though it will not thrive ſo well on them.

Many other inſtances of the invention of trivial names will be met with in the Syſtema Naturæ, particularly among the Butterflies and Moths. To prevent confuſion from the great number of ſpecies which conſtitute the genus of *Phalæna*, they are diſtributed into ſections, and diſtinguiſhed by the terms of *Bombyces*, *Noctuæ*, *Geometræ*, *Tortrices*, *Pyralides*, *Tineæ*, and *Alucitæ*. The *Bombyces* and *Noctuæ*, which are ſo much alike, that the females of the *Bombyces* are with great difficulty diſtinguiſhed from the *Noctuæ*, are named promiſcuouſly.

All

All thoſe of the Geometræ have their names terminating in *aria* and *ata*, according as their antennæ are *ſetaceous* or *pectinated*. The Tortrices in *aria*; the Pyralides in *alis*; the Tineæ in *ella*; and the Alucitæ in *Dactyla*; ſo that it is evident from the termination itſelf to what ſection the inſect is to be referred.

It were to be wiſhed that ſimilar inſtitutions could be formed throughout the whole ſcience, as here the name itſelf ſerves to diſtinguiſh the inſect.

Butterflies are divived into ſections, by the names of Equites, Heliconii, Danai, Nymphales, and Plebeii.

In ſuch a multitude of Butterflies, the greateſt part of which are foreign and extra-european, and to whoſe food and manner of life we are utter ſtrangers, it was impoſſible to give ſignificant tri-

vial names. Linnæus, therefore, by way of ſimile, has taken the names of the Equites from the Trojan hiſtory. Theſe conſiſt, as it were, of two troops or bodies; of which one contains the ſable, and, as it were, mourning Nobles, having red or bloody ſpots at the baſis of their wings. Theſe receive names from the Trojan Nobles; and as Priam was King of Troy, the moſt ſplendid among theſe bear his name. The other body, ornamented with a variety of gay colours, are diſtinguiſhed by the names of the Grecian Heroes; and as in both armies there were Kings, as well as officers of an inferior rank, thoſe elegant butterflies, whoſe hinder wings reſembled tails, were diſtinguiſhed by ſome royal name. Thus when Paris is mentioned (knowing from hiſtory that he was a Trojan, and

of

of royal blood) I find him among thoſe of the firſt ſection; that is, thoſe of a ſable colour, ſpotted in the breaſt with red, and having their hinder wings reſembling tails. When Agamemnon is named, I remember him to be a noble Greek, and find him among thoſe nobles which have variegated and ſwallow-tailed wings. But when Nereus is ſpoken of, I readily know him to belong to the laſt ſection, with wings having no tails.

The ſecond claſs, which contains the Heliconii, derive their names from the Muſes, as Urania. The names of the ſons and daughters of Danaus are beſtowed on the third ſection. And as theſe ſpecies are ſubdivided into two other ſections, viz. the white and parti-coloured, the metaphor is ſo conducted, that the white ones preſerve the

names of the daughters of Danaus, and the parti-coloured ones thoſe of the ſons of Egyptus; ſo that it is evident from the name itſelf to what ſection the butterfly is to be referred.

The names of the fourth ſection, Nymphales, are taken from various nymphs of antiquity; and thoſe of the fifth ſection, Plebeii, are ſelected from different men among the ancients, whoſe names are worthy of remembrance; ſo that by this means a knowledge of the ancients may be interſperſed, and this agreeable ſcience be made doubly pleaſing.

Thoſe, therefore, who ſhall find new Lepidoptera, and give them new names, will do well to follow this method, unleſs it be apparent what food the inſect chiefly ſubſiſts on.

Color,

Color. The Colour, which ſo frequently occurs in other parts of natural hiſtory, but more eſpecially in this, cannot be deſcribed by words ſufficiently expreſſive, but muſt be learned from ocular inſpection only. On this ſubject we willingly refer the reader to the Entomologia Carniolica of Scopoli; he very ingeniouſly informs us what mixtures are neceſſary to produce all the varieties of Colour.

The great diverſity in the male and female inſects of this claſs, and more particularly in thoſe of the Hymenoptera, occaſions great difficulties. It is probable that when we become better acquainted with them, we ſhall find the number of ſpecies to be conſiderably leſs, eſpecially of Tenthredines and Ichneumons.

The menſuration of inſects ſeems to merit ſome attention, and various authors

thors have accordingly meaſured the length and breadth of them by lines. An inſect that is become perfect, after the firſt expanſion of its wings, continues always of the ſame ſize. We are nevertheleſs liable to many deceptions from it; for if the inſect in its Larva ſtate ſhould have been deprived of proper nouriſhment, it will be leſs when perfect than others of the ſame ſpecies. It happens, likewiſe, that the ſame ſpecies of inſects varies greatly in ſize in different countries. Thus the Silpha Veſpillo in America is twice as large as ours.

To conclude, we would earneſtly recommend to thoſe gentlemen whoſe ſummer reſidence is in the country, a farther inveſtigation of the metamorphoſes of inſects. They would derive much entertainment and rational pleaſure from devoting their leiſure moments

to

to the bringing up the Larvæ of inſects, and attentively obſerving their various transformations, their œconomy in procuring food, their dexterity in preparing habitations, and every other thing they are engaged in. By this means many inſects, and their wonderful properties, which have remained in obſcurity from the beginning of time, would be brought to light, more eſpecially if theſe gentlemen would themſelves deſcribe or communicate their diſcoveries to ſome academy of ſciences. Thus would they at one and the ſame time enrich the ſcience of natural hiſtory, and tranſmit their names to poſterity with honour.

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